PATENT ABSTRACTS OF JAPAN

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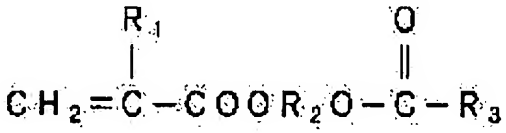
(54) INTRAOCULAR LENS

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an intraocular lens which allows the rapid execution of softening of the base material of the intraocular lens at a high yield and is capable of suppressing the aftercataract liable to occur in the hydrous lens by using specific esterified matter as a compositoin-component of the bendable intraocular lens which is inserted in place of a crystalline lens in cataract surgery, etc.

SOLUTION: This esterified matter expressed by the formula is used as the composition-component of this intraocular lens. In the formula, R1 denotes H or CH3; R2 is selected from a group consisting of up to 2-20C straight chain or branched chain and cyclic alkylenes; R3 is selected from a group consisting of up to 2-20C straight chain, branched chain and cyclic alkyls or the like. At the time of production, the base material for the intraoculer lens containing a hydrous vinyl monomer having a hydroxyl group in the composition and an acid halogen compound are reacted to esterify the section of the hydroxyl group. Such intraocular lens is formed by molding the base material for the intraocular lens to the shape of the intraocular lens prior to the reaction with the acid halide.



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* NOTICES *

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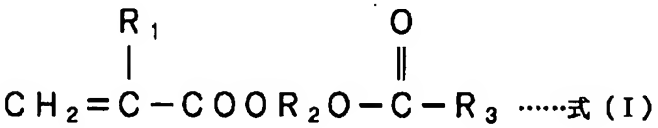
CLAIMS

[Claim(s)]
[Claim 1] Formula (I)
[Formula 1]



The intraocular implant which comes out and considers the esterification object shown as a formed part. R1 expresses H or CH3 among a formula, R2 is chosen from the group which consists of the shape of a straight chain to carbon numbers 2-20, branched-chain, and annular alkylene, and R3 is chosen from the group which consists of the shape of a straight chain of carbon numbers 2-20, branched-chain, annular alkyl, or alkyl containing a fluorine.
[Claim 2] The intraocular implant characterized by being obtained by the production process which the base material for intraocular implants and acid halide which contain a water nature vinyl system monomer with hydroxyl in a presentation are made to react, and esterifies the part of said hydroxyl.
[Claim 3] The intraocular implant of claim 2 is an intraocular implant characterized by fabricating the base material for intraocular implants in the configuration of an intraocular implant before making it react with acid halide.
[Claim 4] The base material for intraocular implants of claim 2 is an intraocular implant characterized by carrying out copolymerization of a water nature vinyl system monomer with hydroxyl, and the non-water nature vinyl system monomer which does not contain hydroxyl.
[Claim 5] The water nature vinyl system monomer of claim 4 is an intraocular implant which is 2-hydroxyethyl methacrylate and is characterized by carrying out copolymerization of the 2-hydroxyethyl methacrylate 45% of the weight or more in said base material for intraocular implants.
[Claim 6] It is the intraocular implant characterized by carrying out the water of said base material for intraocular implants before said esterification in the intraocular implant of claim 2.
[Claim 7] It is the intraocular implant characterized by performing said esterification in the intraocular implant of claim 2, heating.
[Claim 8] The intraocular implant characterized by adding a base catalyst from the beginning or reaction middle in the intraocular implant of claim 2 in case said esterification is performed.
[Claim 9] It is the intraocular implant which makes a metal salt the part of the hydroxyl of said base material for intraocular implants after water, and is characterized by carrying out esterification processing of said metal salt in an acid chloride in the intraocular implant of claim 2.
[Claim 10] It is the intraocular implant characterized by said base material for intraocular implants containing a phenyl group in the intraocular implant of claim 2.
[Claim 11] It is the intraocular implant characterized by said base material for intraocular implants containing a fluorine in the intraocular implant of claim 2.
[Claim 12] It is the intraocular implant characterized by said base material for intraocular implants containing an ultraviolet ray absorbent in the intraocular implant of claim 2.

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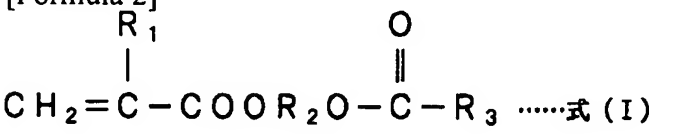
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the bendable intraocular implant inserted instead of a lens by a cataract operation etc.
[0002]
[Description of the Prior Art] In the cataract operation in recent years, many intraocular implants are used as a substitute of a lens. A methacrylic acid hard by non-water nature, the 2-hydroxyethyl methacrylate (HEMA) which will become elasticity if water is included by water nature are known by the ingredient used as the base material of an intraocular implant.
[0003] The hard intraocular implant had the problem that an incision will become large at the time of eye interpolation close, compared with the elastic intraocular implant which water nature can bend.
[0004] Then, the intraocular implant used for it from the former, making the carboxyl group (-COOH) which acrylic hard polymers, such as a methacrylic acid and an acrylic acid, have soften a hard base material according to esterification to which alcohol (R-OH) is made to add by dehydration is proposed.
[0005]
[Problem(s) to be Solved by the Invention] However, since the above-mentioned esterification was a reversible reaction, there was a problem of it having been difficult to advance a reaction by high yield, and also taking time amount.
[0006] Moreover, since it is very [in steric hindrance] difficult, it is not so realistic to halogenate the carboxyl group which the polymer used as a base material has, although how to make the acid halide (- COX) obtained by changing to the conventional esterification and halogenating said carboxyl group (-COOH) using halogens, such as chlorine, react with alcohol (R-OH), and carry out esterification processing is also considered. Furthermore, since acid halide is the very unstable matter, neither return nor this [its] which becomes empty is also realistic [the approach halogenate an acrylic monomer previously and it carries out a polymerization is considered independently, and] by heating to a carboxyl group.
[0007] Moreover, by one side, the report that the lens of water nature is seen becoming a secondary cataract in comparatively many cases compared with the case where the lens of non-water nature is inserted is also carried out.
[0008] So, it aims at offering the bendable intraocular implant which controls the secondary cataract which can soften the base material of an intraocular implant by the short time and high yield, and is easy to happen to the lens of water nature in view of the trouble of the above-mentioned conventional technique in this invention.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it is characterized by equipping this invention with the following configurations.
[0010] (1) Formula (I)
[Formula 2]



$$CH_2=C(R_1)-COOR_2O-C(=O)-R_3 \quad \cdots\cdots \text{式 (I)}$$

The intraocular implant which comes out and considers the esterification object shown as a formed part. R1 expresses H or CH3 among a formula, R2 is chosen from the group which consists of the shape of a straight

chain to carbon numbers 2-20, branched-chain, and annular alkylene, and, as for R3, it is desirable to be chosen from the group which consists of the shape of a straight chain of carbon numbers 2-20, branched-chain, annular alkyl, or alkyl containing a fluorine.

[0011] (2) The base material for intraocular implants and acid halide which contain a water nature vinyl system monomer with hydroxyl in a presentation are made to react, and it is characterized by being obtained by the production process which esterifies the part of said hydroxyl.

[0012] (3) Before the intraocular implant of (2) makes it react with acid halide, it is characterized by fabricating the base material for intraocular implants in the configuration of an intraocular implant.

[0013] (4) The base material for intraocular implants of (2) is characterized by carrying out copolymerization of a water nature vinyl system monomer with hydroxyl, and the non-water nature vinyl system monomer which does not contain hydroxyl.

[0014] (5) The water nature vinyl system monomer of (4) is 2-hydroxyethyl methacrylate, and is characterized by carrying out copolymerization of the 2-hydroxyethyl methacrylate 45% of the weight or more in said base material for intraocular implants.

[0015] (6) In the intraocular implant of (2), it is characterized by carrying out the water of said base material for intraocular implants before said esterification.

[0016] (7) In the intraocular implant of (2), it is characterized by performing said esterification, heating.

[0017] (8) In the intraocular implant of (2), in case said esterification is performed, it is characterized by adding a base catalyst from the beginning or reaction middle.

[0018] (9) In the intraocular implant of (2), it is characterized by making the part of the hydroxyl of said base material for intraocular implants into a metal salt after water, and carrying out esterification processing of said metal salt in an acid chloride.

[0019] (10) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing a phenyl group.

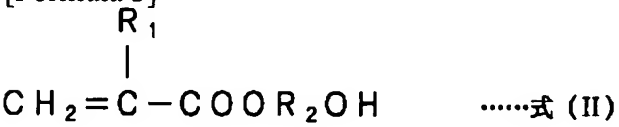
[0020] (11) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing a fluorine.

[0021] (12) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing an ultraviolet ray absorbent.

[0022]

[Embodiment of the Invention] (1) Use the approach of esterifying the part of the hydroxyl which the polymer used as the base material of an intraocular implant has with acid halide, and softening a base material, in base material manufacture this invention of an intraocular implant. Therefore, the vinyl system monomer which had the hydroxyl shown by the formula (II) in the presentation part of the polymer to be used can be mentioned.

[Formula 3]



$$CH_2=C(R_1)-COOR_2OH \quad \cdots\cdots \text{式 (II)}$$

R1 expresses H or CH3 among a formula, and R2 is chosen from the group which consists of the shape of a straight chain to carbon numbers 2-20, branched-chain, and annular alkylene.

[0023] Moreover, the following can be used besides the vinyl system monomer shown by the formula (II). In addition, that it is with "-- (meta) acrylate" on a notation expresses "-- acrylate" or "-- methacrylate."

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, actuation can offer a bendable intraocular implant in a short time by high yield using simple and the method of softening the base material for intraocular implants as mentioned above.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since the above-mentioned esterification was a reversible reaction, there was a problem of it having been difficult to advance a reaction by high yield, and also taking time amount.
[0006] Moreover, since it is very [in steric hindrance] difficult, it is not so realistic to halogenate the carboxyl group which the polymer used as a base material has, although how to make the acid halide (- COX) obtained by changing to the conventional esterification and halogenating said carboxyl group (-COOH) using halogens, such as chlorine, react with alcohol (R-OH), and carry out esterification processing is also considered. Furthermore, since acid halide is the very unstable matter, neither return nor this [its] which becomes empty is also realistic [the approach halogenate an acrylic monomer previously and it carries out a polymerization is considered independently, and] by heating to a carboxyl group.
[0007] Moreover, by one side, the report that the lens of water nature is seen becoming a secondary cataract in comparatively many cases compared with the case where the lens of non-water nature is inserted is also carried out.
[0008] So, it aims at offering the bendable intraocular implant which controls the secondary cataract which can soften the base material of an intraocular implant by the short time and high yield, and is easy to happen to the lens of water nature in view of the trouble of the above-mentioned conventional technique in this invention.

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MEANS

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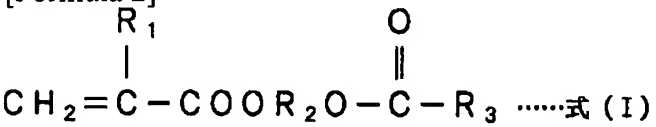


The intraocular implant which comes out and considers the esterification object shown as a formed part. R1 expresses H or CH3 among a formula, R2 is chosen from the group which consists of the shape of a straight chain to carbon numbers 2-20, branched-chain, and annular alkylene, and, as for R3, it is desirable to be chosen from the group which consists of the shape of a straight chain of carbon numbers 2-20, branched-chain, annular alkyl, or alkyl containing a fluorine.
[0011] (2) The base material for intraocular implants and acid halide which contain a water nature vinyl system monomer with hydroxyl in a presentation are made to react, and it is characterized by being obtained by the production process which esterifies the part of said hydroxyl.
[0012] (3) Before the intraocular implant of (2) makes it react with acid halide, it is characterized by fabricating the base material for intraocular implants in the configuration of an intraocular implant.
[0013] (4) The base material for intraocular implants of (2) is characterized by carrying out copolymerization of a water nature vinyl system monomer with hydroxyl, and the non-water nature vinyl system monomer which does not contain hydroxyl.
[0014] (5) The water nature vinyl system monomer of (4) is 2-hydroxyethyl methacrylate, and is characterized by carrying out copolymerization of the 2-hydroxyethyl methacrylate 45% of the weight or more in said base material for intraocular implants.
[0015] (6) In the intraocular implant of (2), it is characterized by carrying out the water of said base material for intraocular implants before said esterification.
[0016] (7) In the intraocular implant of (2), it is characterized by performing said esterification, heating.
[0017] (8) In the intraocular implant of (2), in case said esterification is performed, it is characterized by adding a base catalyst from the beginning or reaction middle.
[0018] (9) In the intraocular implant of (2), it is characterized by making the part of the hydroxyl of said base material for intraocular implants into a metal salt after water, and carrying out esterification processing of said metal salt in an acid chloride.
[0019] (10) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing a phenyl group.
[0020] (11) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing a fluorine.
[0021] (12) In the intraocular implant of (2), it is characterized by said base material for intraocular implants containing an ultraviolet ray absorbent.
[0022]
[Embodiment of the Invention] (1) Use the approach of esterifying the part of the hydroxyl which the polymer used as the base material of an intraocular implant has with acid halide, and softening a base material, in base material manufacture this invention of an intraocular implant. Therefore, the vinyl system monomer which had

the hydroxyl shown by the formula (II) in the presentation part of the polymer to be used can be mentioned.
[Formula 3]

……式 (II)

R1 expresses H or CH3 among a formula, and R2 is chosen from the group which consists of the shape of a straight chain to carbon numbers 2-20, branched-chain, and annular alkylene.
[0023] Moreover, the following can be used besides the vinyl system monomer shown by the formula (II). In addition, that it is with "-- (meta) acrylate" on a notation expresses "-- acrylate" or "-- methacrylate."
[0024] A vinyl system monomer (only henceforth a water nature monomer) with hydroxyls, such as hydroxyl content (meta) acrylate, such as dihydroxy propyl (meta) acrylate, dihydroxy butyl (meta) acrylate, diethylene-glycol monochrome (meta) acrylate, triethylene glycol monochrome (meta) acrylate, and dipropylene glycol monochrome (meta) acrylate, and acrylic acids (meta), can be mentioned.
[0025] Moreover, it is also possible to use the combination of copolymerization with the monomer of the non-water nature for not reacting to a base material with the above-mentioned monomer and acid halide, but making the hardness of a lens adjust. The monomer of non-[these] water nature can use what is expressed to a formula (III).
[Formula 4]

……式 (III)

R1 expresses H or CH3 among a formula, and R4 is chosen from the group which consists of the shape of a straight chain to carbon numbers 1-20, branched-chain, and annular alkyl.
[0026] The following can be used for the base material shown by the formula (III). In addition, that it is with "-- (meta) acrylate" on a notation expresses "-- acrylate" or "-- methacrylate."
[0027] Methyl (meta) acrylate, ethyl (meta) acrylate, propyl (meta) acrylate, n-butyl (meta) acrylate, tert-butyl (meta) acrylate, Isobutyl (meta) acrylate, n-pentyl (meta) acrylate, tert-pentyl (meta) acrylate, hexyl (meta) acrylate, 2-methylbutyl (meta) acrylate, heptyl (meta) acrylate, Nonyl (meta) acrylate, stearyl (meta) acrylate, cyclopentyl (meta) acrylate, The shape of a straight chain, such as cyclohexyl (meta) acrylate, branched-chain, annular alkyl (meta) acrylate, and silicon content (meta) acrylate can be mentioned.
[0028] The copolymerization object of the water nature monomer and non-water nature monomer which were mentioned above is used for one base material of the intraocular implant manufactured with the gestalt of this operation (composition), for example, the combination of 2-hydroxyethyl methacrylate and ethyl methacrylate etc. is mentioned to it. Naturally, only a water nature monomer can also be used as a base material of an intraocular implant. Moreover, in consideration of the stability of these polymers, the cross linking agent represented by ethylene glycol (meta) acrylate, diethylene-glycol (meta) acrylate, etc. can also be added. These cross linking agents are usually used in 3 - 10% of the weight of the range, and its 5-% of the weight order is preferably desirable. Moreover, if it exceeds 10 % of the weight, it will become the cause by which a base material becomes weak. The polymerization of a base material is performed using a polymerization initiator. For example, azo iso GUCHIRO valeronitrile etc. is mentioned to a polymerization initiator.
[0029] Next, the base material for intraocular implants is compounded using the monomer mentioned above. Predetermined boils comparatively a water nature monomer, a non-water nature monomer, and a cross linking agent, and it puts into a container and mixes. Although the compounding ratio of the water nature monomer for constituting these copolymerization objects and a non-water nature monomer is generally suitably chosen according to each physical properties In the example which used HEMA for the water nature monomer, if about 7:3 are desirable and the compounding ratio of HEMA is less than 45 % of the weight, even if the compounding ratio of a water nature monomer and a non-water nature monomer will esterify, moderate softness does not come out of it, but bending by SESSHI of ophthalmic surgery becomes less easy.
[0030] Moreover, the thing of a cylindrical shape with a larger path a little than the periphery of an intraocular implant is used for the container used for a polymerization in order to cut the done base material in the configuration of an intraocular implant in cutting of the following process.

[0031] When mixing of a water nature monomer, a non-water nature monomer, and a cross linking agent is completed, next put in a polymerization initiator, it is made to react under ordinary temperature and ordinary pressure, and a polymerization is made to start. After that, one by one, it puts into a water bath (50 degrees C, 60 degrees C, and 70 degrees C) by a unit of 6 hour, and a polymerization is carried out to it. Although a polymerization can also be performed only at high temperature (for example, 70 degrees C, 80 degrees C), if temperature is raised gradually in this way, the polymerization stabilized more can be performed. After about 18 hour has passed since polymerization initiation in such a procedure, a base material [finishing / a polymerization] is picked out from a container, and it puts into oven for dehydration, and is made to dry in 100 degrees C and 24 hours.

[0032] (2) Perform cutting which processes into the configuration of an intraocular implant cutting, next the base material obtained by carrying out a polymerization in this way. Here, the manufacture approach of 1 piece lens is described concretely. First, a base material is made tabular [of fixed thickness] and what serves as a radical (core) of an intraocular implant from there is clipped disc-like. The core clipped disc-like next is attached in a jig. If anchoring finishes, cutting of one side of a core is carried out to the configuration of an actual intraocular implant. If processing of one side is completed, a core will be removed from a jig, and it attaches in a jig once again so that cutting of the opposite side can be carried out. If anchoring finishes, cutting of the opposite side is carried out to the configuration of an intraocular implant like previously. It will grind, if both sides are finished, and it washes, and is completed through inspection of a front face, a dimension, an optical property, an appearance, etc.

[0033] (3) esterification processing -- pass the above processes -- explain how to soften the base material used as the configuration of an intraocular implant according to esterification next. In this invention, although the hydroxyl of a base material is esterified, acid halide as shown in a formula (IV) is used. The inside X of a formula is a halogen and R3 is chosen from the group which consists of the shape of a straight chain of carbon numbers 2-20, branched-chain, annular alkyl, or alkyl containing a fluorine.

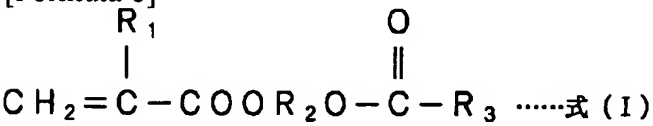
[Formula 5]

……式 (IV)

The amount of the acid halide to be used is good in an amount to the extent that a base material is flooded with acid halide.

[0034] Esterification makes an intraocular implant immersed in acid halide under ordinary temperature and ordinary pressure for about 5 hours. Consequently, it supposes that the hydroxyl which the water nature monomer has is alcohol, acts, it reacts with acid halide, and esterification is performed. If esterification is performed, the component except the halogen of acid halide will be added to a water nature monomer side, and an esterification object as shown in a formula (I) is obtained.

[Formula 6]

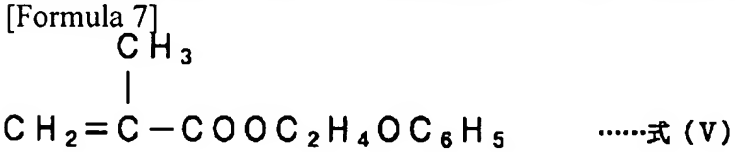


……式 (I)

[0035] After the above-mentioned esterification processing, after washing the acid halide which has adhered to the intraocular implant with the methanol extraction method, it placed into vacuum oven and dried at 95 degrees C for 6 hours. Although it did not have flexibility firmly in the dryness before esterification processing, since the steric hindrance nature of the intraocular implant to which processing was performed in a base material improved and a polymer made it flexible, it was easily bendable at dryness in SESSHI of ophthalmic surgery.

[0036] Moreover, in order to ask for the yield of the esterification object obtained with the gestalt of this operation, it asked for the water content esterification processing before and after processing, and asked for yield by change of this water content. The processing back before processing in order to measure water content carried out the same processing as autoclave sterilization (after sealing for 30 minutes at 121 degrees C and putting in into water, it takes out under ordinary temperature and ordinary pressure, and the moisture of the circumference of a lens is wiped off and processed), and measured the weight of the base material of a moisture state.

[0037] Next, in order to evaporate the excess water contained in the base material, it was left in the vacua at 95 degrees C overnight, and the weight of the base material in the condition that moisture fell out was measured. It asked for the water content esterification processing before and after processing from these data.
[0038] Since softening of the base material for intraocular implants in the conventional technique used the esterification reaction which carries out dehydration addition of the alcohol for the carboxyl group which the polymer used as a base material has, although the same base material for intraocular implants is softened from 24 hours to it having taken several weeks depending on the case, it can be managed in about 5 hours by this invention. Moreover, by using acid halide, since esterification which is usually a reversible reaction progresses to a target on the other hand by using acid halide, yield also becomes high.
[0039] Moreover, if the water of the base material which passed through cutting before carrying out esterification processing is carried out for 10 - 15 minutes at 121 degrees C, a processing solution (acid halide) for spacing between the polymers of a base material to carry out breadth and esterification will become easy to sink into a base material, and a reaction will become easier to progress.
[0040] Furthermore, the acid halide used for esterification is good to add the dehydrating agent at the time of storage, in order to react violently with water, to exclude excessive water, and to make it not degrade the activity of acid halide. In addition, the dehydrating agent to be used is good the anything currently used as an absorbent of moisture, such as a molecular sieve.
[0041] If it heats, in order that a reaction may progress well, when a chemical reaction heats among about 40-100 degrees C during esterification processing, its progress of a reaction is good further again.
[0042] In addition, if base solvents which are the pyridines, the quinolines, piperidines, and inorganic bases which are an organic base, such as a sodium hydroxide and a calcium hydroxide, are added from the reaction middle before esterifying or, esterification will progress early more by the uniform catalytic reaction.
[0043] Moreover, even if it makes into the metal salt hydroxyl which a water nature monomer has using inorganic bases, such as a sodium-hydroxide water solution, and processes with acid halide, esterification progresses early more. Since a salt remains as a resultant that an acid product cannot remain easily after esterification processing, this approach is a safer approach.
[0044] Furthermore, the monomer which contains a phenyl group as a copolymerization component with a water nature monomer, for example, phenoxy ethyl methacrylate as shown in a formula (V), other phenyl methacrylate, phenyl acrylate, benzyl methacrylate, etc. are mentioned. Since the refractive index of a lens will become high if a phenyl group is included, as for this, the part lens is thin, and it ends, and as a result, an incision is small in the case of an operation, and it ends at it.
[Formula 7]



……式 (V)

[0045] It is good to use as a copolymerization component with a water nature monomer the monomer, 1, 1, 1, 3, and 3, which contains a fluorine in the functional group of acrylic ester or methacrylic ester, 3-hexafluoro isopropyl methacrylate, 2, 2 and 3, 3-tetrafluoro propyl methacrylate, etc. further again, or to include a fluorine in the alkyl side of acid halide. [for example,] This is because the effectiveness of being easy to treat, without being lost with [on the front face of a lens] solid one by adding a fluorine, and an intraocular implant sticking to SESSHI for an operation in the case of a cataract operation is acquired.
[0046] In addition to this, by using the ultraviolet ray absorbent of benzophenone systems, such as for example, a 4-meta-chestnut ROKISHI-2-hydroxy benzophenone and a 4-(2-acryloxy ethoxy)-2-hydroxy benzophenone, and the ultraviolet ray absorbent of a benzotriazol system as a copolymerization component, it can be used for the base material for intraocular implants, or mixed solidification can be carried out physically and it can also be used for the base material for intraocular implants.
[0047] Hereafter, an example is given and explained concretely.
<Example 1> The base material of an intraocular implant is selected first. The monomer used as a base material makes ethyl methacrylate the 12.5 weight sections, in order to adjust the hardness of the intraocular implant which manufactures 2-hydroxyethyl methacrylate by 85 weight sections and non-water nature. As these and a cross linking agent, ethylene glycol dimethacrylate is put into 2.5 weight sections containers, and is often mixed.

[0048] Next, the polymerization initiator azo iso GUCHIRO valeronitrile 0.05 weight section is put into a container, and it mixes under ordinary temperature and ordinary pressure, and after putting into a water bath (50 degrees C, 60 degrees C, and 70 degrees C) by a unit of 6 hour and carrying out a polymerization to it one by one, it is made to dry in 100-degree C oven for 24 hours. The base material which the polymerization completed is picked out from a container after desiccation, and it begins to delete in the configuration of an intraocular implant by cutting.

[0049] Next, it esterifies in order to soften the base material which it began to shave in the configuration of an intraocular implant. In order to make an esterification reaction easy to advance as bottom preparation, the water of the base material is fully carried out by the same processing as autoclave sterilization. After the water of the base material is fully carried out, it is immersed in n-butyryl chloride which is acid halide under ordinary temperature and ordinary pressure for 5 hours, and esterification processing is performed.

[0050] n-butyryl chloride was washed with the methanol extraction method after esterification processing, and it placed into vacuum oven, and dried at 95 degrees C for 6 hours. Although this lens did not have flexibility firmly in the dryness before processing, the lens after processing was dryness and easily bendable at SESSHI of ophthalmic surgery. Moreover, after processing was 5 or less % of the weight to the lens of water content before esterification processing being 30 % of the weight.

[0051] The polymerization of a base material is first performed like the <example 2> example 1. The phenoxy ethyl methacrylate 55 weight section, the 2-hydroxyethyl methacrylate 45 weight section, and the polymerization initiator azo iso GUCHIRO valeronitrile 0.05 weight section are put into a container. Said base material is mixed under ordinary temperature and ordinary pressure, and after putting into a water bath (50 degrees C, 60 degrees C, and 70 degrees C) by a unit of 6 hour and carrying out a polymerization to it one by one, it is made to dry in 100-degree C oven for 24 hours.

[0052] After making it dry, the base material which the polymerization completed is picked out from a container, and it begins to delete in the configuration of an intraocular implant by cutting. Next, it esterifies in order to soften the base material which it began to shave in the configuration of an intraocular implant. In order to make an esterification reaction easy to advance as bottom preparation, the water of the base material is fully carried out by the same processing as autoclave sterilization. After the water of the base material is fully carried out, it is immersed in n-butyryl chloride which is acid halide under ordinary temperature and ordinary pressure for 5 hours, and esterification processing is performed.

[0053] n-butyryl chloride was washed with the methanol extraction method after esterification processing, and it placed into vacuum oven, and dried at 95 degrees C for 6 hours. Although this lens did not have flexibility firmly in the dryness before processing, the lens after processing was dryness and easily bendable at SESSHI of ophthalmic surgery. Moreover, after processing was 5 or less % of the weight to the base material of water content before esterification processing being 15 % of the weight.

[0054] In the above-mentioned examples 1 and 2, in order to make it easy to progress a reaction before esterification processing, the water of the base material was carried out, but even if it does not carry out water, sufficient softening of a lens is seen only by esterification processing.

[0055] Moreover, change of the water content in esterification (reaction of a carboxyl group and hydroxyl) of an intraocular implant base material currently conventionally performed as an example 1 of a comparison is described. The presentation of the used base material performed esterification processing, after ethylene glycol phenylethyl acrylate compounded the base material 61% of the weight as 29 % of the weight of acrylic acids, and 10 % of the weight of ethylene glycol dimethacrylate. The esterification art esterified by making n-propyl alcohol contain 5% of concentrated sulfuric acid, putting in a sample [there] (base material of the above-mentioned presentation) making it esterify, and heating at 95 degrees C. The water content after the esterification processing for 5.6% and six days of the water content after the esterification processing for three days was 4.1% to the water content before the esterification processing at this time having been 13.3 % of the weight.

[0056] by the manufacture approach of this invention, the value more than comparable was acquired also for the conversion (yield) of esterification which boils the rate of esterification markedly and is acquired early from the result of examples 1 and 2 and the example 1 of a comparison compared with the former. Moreover, since softening becomes possible, without carrying out water by making the hydroxyl of the polymer used as a base material esterify, it is thought that control of a secondary cataract is obtained compared with carrying out the water of the usual water nature lens, and using it.

[Translation done.]

* NOTICES *

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 2nd partition of the 1st section
[Publication date] August 26, Heisei 15 (2003. 8.26)

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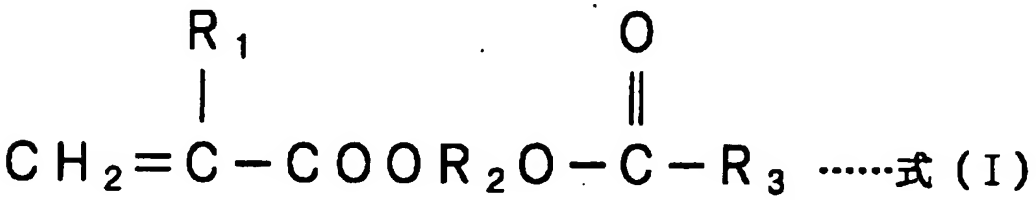
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] Formula (I)
[Formula 1]



The intraocular implant which comes out and considers the esterification object shown as a formed part. R1 expresses H or CH3 among a formula, R2 is chosen from the group which consists of the shape of a straight chain to carbon numbers 2-20, branched-chain, and annular alkylene, and R3 is chosen from the group which consists of the shape of a straight chain of carbon numbers 2-20, branched-chain, annular alkyl, or alkyl containing a fluorine.
[Claim 2] The intraocular implant characterized by being obtained by the production process which the base material for intraocular implants and acid halide which contain a water nature vinyl system monomer with hydroxyl in a presentation are made to react, and esterifies the part of said hydroxyl.
[Procedure amendment 2]

[Document to be Amended] Specification
[Item(s) to be Amended] 0012
[Method of Amendment] Deletion
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0013
[Method of Amendment] Deletion
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0014
[Method of Amendment] Deletion
[Procedure amendment 5]
[Document to be Amended] Specification
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[Method of Amendment] Deletion
[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0016
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[Procedure amendment 7]
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[Procedure amendment 9]
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[Item(s) to be Amended] 0019
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[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0020
[Method of Amendment] Deletion
[Procedure amendment 11]
[Document to be Amended] Specification
[Item(s) to be Amended] 0021
[Method of Amendment] Deletion

[Translation done.]